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species; while with complete isolation more or less divergence may result before diversity of selection comes in to intensify the segregation.

Of selection I also discover many reflexive forms due to the influence of members of the same species upon each other, as well as natural selection and artificial selection due to influences lying outside of the species.

In considering the factors producing different inheritable types of related organisms we have to distinguish between the factors dividing the original stock into separate inter-generating groups and those producing diversity of inherited character in the separate groups. The former process we may call racial demarcation through isolation, and the latter racial intensification through survival resulting in selection. Isolation and selection we find to be cooperating factors in controlling racial segregation.

Our investigation of the factors producing evolution will, however, remain very incomplete unless we study the influences producing different social groups, in which different habits of dealing with the environment are originated and maintained, not by variation and heredity, but by innovation and tradition. Here again we must distinguish between the influences dividing the original group into separately associating groups, and those that establish a diversity of habits and acquired characters in the separate groups. The former process we may call habitual demarcation through partition and the latter habitual intensification through success resulting in election. Partition and election we find to be cooperating factors in controlling habitual segregation.

In the bionomic history of many species the great significance of habitual segregation is found in the fact that it is the forerunner of racial segregation.

For illustrations of the influence of habitual segregation on racial segregation I would refer to my work on evolution published by the Carnegie Institution.

JOHN T. GULICK.

OAKLAND, CAL.

#### SALMON HYBRIDS.

TO THE EDITOR OF SCIENCE: I have received from Mr. C. W. Dorr, of the Alaska Packers' Association, certain notes by Mr. J. A. Richardson on experiments in hybridization of salmon, undertaken in the hatchery at Karluk, Alaska. These will be of interest to zoologists.

DAVID STARR JORDAN.

Mr. Richardson writes as follows:

Crosses have been made of all of the salmon family except the steelhead. These experiments have been made for the novelty of it. The peculiarities of each are invariably the same from year to year, and practically none of the fry survive.

The cross between the red salmon and king salmon produces a very queer lot. Out of many thousand eggs hatched, ninety per cent. of the fry will have no eyes; the nose is long and pointed; the sac is of very light color and quite watery in appearance. Only two per cent. or three per cent. are reasonably well formed fish, and the most of these die.

The number of eggs which fertilize is about normal, but it is noticed that a larger number than usual of the white eggs removed from the baskets contain embryos that have ceased to develop. This cross has been made both ways.

It has been demonstrated that the cross between the red salmon male and the humpback female is very superior to other crosses—so much so that it leads to the belief that there is closer relationship between these two species of the salmon family. An extended experiment by crossing these two species is now being carried on. The loss of eggs and fry is being counted and notice taken of general conditions. We have fine specimens from the season 1904 (eggs taken in 1903) of this cross. They are about eight months old, two inches long, and bright, clean, silvery fish, rather long and slim.

#### SPECIAL ARTICLES.

AN INTERESTING DISCOVERY OF HUMAN IMPLEMENTS IN AN ABANDONED RIVER CHANNEL IN SOUTHERN OREGON.

DURING July and August, 1905, the writer was in the field in southern Oregon under the

direction of Dr. David T. Day, chief of the Division of Mineral Statistics of the U. S. Geological Survey. The work assigned was the collection of black sands and crude gravels from the placer mines of this section for the experimental concentrating plant of the survey at the Portland exposition. While visiting Waldo, Ore., the following occurrence of human implements in the gravels of the Deep Gravel Mining Company was met, and with the permission of the Director of the Survey is herewith communicated.

Waldo is situated on the stage line from Grants Pass on the Southern Pacific Railroad, one hundred miles south of west to Crescent City on the coast, and is forty miles from Grants Pass. It is in Josephine County, a few miles north of the California line.

Waldo was the scene of the earliest discovery in Oregon of stream placers in the country back from the ocean. Sailors penetrated to it in 1853 and found rich pay-streaks in the bed of a small stream which heads up in the ancient gravels of what must once have been a large river. The discovery received the name of the Sailor Diggings and the name Waldo came later. The ancient gravels are now on top of a ridge and have remained in relief while the former banks have been removed by erosion. The course of the river was to the north, since its bed-rock declines in this direction. The bed-rock as exposed in the placer mines is chiefly serpentine, but in one place the rim-rock is fossiliferous sandstone, which has been studied and determined by J. S. Diller. The boulders are chiefly eruptive rocks of various sorts and are much softened as a rule by decomposition. The exact relations of the old drainage would require more investigation for their elucidation than the writer could give in the brief time at command, and it can only be stated that they cover a rather wide area—east and west—having been mined at intervals for half a mile or more across the main course, but whether this is from forking of the old main channel or not was not determined. Some shallower gravels are probably due to the washing down of the old high channel deposit

over the slopes and on to the flats on either side of its crest.

Pestles appear to occur in the gravels as a not specially exceptional phenomenon. The operators of the mines speak of their occasional discovery as a matter which does not excite surprise. The following instance, however, of two mortars and of one or two pestles attracted the attention of Mr. W. J. Wimer, the manager and part owner of the Deep Gravel property, and although the objects were brought to light in the hydraulicking during the night shift, he carefully recorded the details early the next morning. The following extract from a letter of Mr. Wimer, written at my request, gives the facts. I particularly inquired about the possibility of the bank's caving in so as to make implements from the surface appear as if buried in the deeper gravels, but this possibility seems to be guarded against both by the auriferous cement in the large mortar and by its actual detection in the bank by the pipe man. The mortars and pestles are now in the possession of Col. T. Waln-Morgan Draper, a well-known mining engineer, at whose summer home, a few miles from Waldo, the implements now are.

The mortar is about twelve inches high by nine inches across, and is made of the hardest granite. Two of our night men piped it out in 1902, when it was firmly embedded in a blue cement gravel (the pay channel), fifty-eight feet from the surface. They had to resort to picks to get it out and the bed or hole out of which they pulled it remained, showing its perfect mould. I went to the mine in the morning and those two men formally presented it to me. It was still packed tightly to its very rim with blue cement gravel. With a sharp pick I carefully picked the gravel loose so that I could clean it. I was some time doing so. I then washed the detritus and got eight pretty large colors of gold.

H. M. Pfefferly and D. W. Yarbrough were the finders. The place was in the S.W.  $\frac{1}{4}$  of N.W.  $\frac{1}{4}$ ; Sec. 21; T. 40 S.; R. 8 W.; W.M., Josephine County, Oregon, on the property of the Deep Gravel Mining Co. The other mortar is what Colonel Draper terms a quartz mortar having a saucer-like cavity on its top. The gold from the ground where it was piped out was pronounced by the Selby Smelting Company in San Francisco

to be 'quartz gold,' their receipt to us being so marked. This mortar was probably about 10 feet under the surface. It was 300 yards from the other one and on Sec. 20, being therefore the S.E.  $\frac{1}{4}$  of N.E.  $\frac{1}{4}$ . It was found in 1901. The pestles were discovered with it; they were in pay dirt.

Those occurrences add one more instance to the list of stone implements which have been found in the auriferous gravels of the Pacific coast. The writer fully realizes the criticism which has been brought to bear upon them and the skepticism with which their authenticity is regarded by many. The Waldo case may be stated upon the testimony of Mr. Wimer and Mr. Pfefferly and may add its contribution to the general mass of evidence regarding the antiquity of man in the far west.

J. F. KEMP.

#### ASTRONOMICAL NOTES.

##### THE NEW SOLAR OBSERVATORY OF THE CARNEGIE INSTITUTION.

THE Carnegie Institution of Washington has established a solar observatory on Mount Wilson, near Pasadena, southern California, under the direction of Professor George E. Hale, former director of the Yerkes Observatory. The late Secretary Langley, of the Smithsonian Institution, whose bolometric studies of the solar radiation during many years have added so much to our knowledge of the sun, was active in urging the claims of such an observatory. He desired to see the observatory established in a tropical or subtropical region, with a large equipment and endowment, especially for the study of the solar radiations and their possible fluctuations.

The Mount Wilson Observatory is the outcome of much thought and investigation by different astronomers, and may be depended upon to furnish splendid results. Mr. Langley, however, in a communication to the committee on astronomy of the Carnegie Institution, in 1902, made the following statement:

It has thus far proved, and, so far as can be seen, always will prove, impossible to determine from near sea-level with any precision by any observations, however careful or long continued,

the 'constant' of solar radiation. There is no good way to eliminate the complex effect of atmospheric absorption except to observe at the highest practicable altitude, preferably near the tropics, but most certainly in a dry and clear atmosphere, and preferably where there are two stations in view of each other, the first of which is at a notably greater altitude than the second, though the latter is itself at least some thousands of feet above sea-level. Temporary expeditions with meager outfits have gone from time to time to high mountain stations for solar observations, and small meteorological stations have even been longer continued. What is needed is rather a permanent astrophysical observatory equipped with the most powerful and refined modern apparatus for solar research and located at the highest and clearest station it is practicable to occupy.

These are very strong words from a very eminent authority. It may not be out of place to inquire whether Mount Wilson fulfills the required conditions. Those who have read Professor Hale's description of the conditions which exist on the mountain during a large part of the year, and have seen the results, already accomplished, will gladly acknowledge that Mount Wilson offers exceptional advantages for such an observatory. That it is the best which the world furnishes, or that the 'last word' can be said from it in regard to the solar constant may be doubted. The institution on Mount Wilson will undoubtedly justify itself, and is probably the best site which could be occupied under the circumstances. There may be several elevations, however, which more closely meet the conditions imposed by Mr. Langley. The writer is familiar with one, which could hardly meet the requirements more exactly if it had been made to order after that communication was written. The volcanic peak, El Misti, near Arequipa, Peru, rises to an altitude of 19,000 feet. It looks down upon the Arequipa station of the Harvard Observatory, whose altitude is 8,000 feet. The whole region is extraordinarily dry and clear. From the summit of El Misti the sky is most strikingly dark and free from haze. This summit is readily accessible by a mule-trail during nearly the whole year, and its use as a permanent station presents few difficulties